

Engineering Design File

Project No. 22901

TSF-09/18 V-Tanks Remediation Crane Verification

**Idaho
Cleanup
Project**

The Idaho Cleanup Project is operated for the
U.S. Department of Energy by CH2M • WG Idaho, LLC

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Bm
8/21/05

EDF No.: 6099 EDF Rev. No.: 0 Project File No.: 22901

1. Title: TSF-09/18 V-Tanks Remediation Crane Verification
2. Index Codes:
Building/Type N/A SSC ID TAN-616 Site Area TAN
3. NPH Performance Category: _____ or N/A
4. EDF Safety Category: C.G. or N/A SCC Safety Category: C.G. or N/A
5. The scope of this EDF is limited to verifying the capability of using the Grove TM 9120 mobile crane for lifting the four V-tanks from the excavation using the existing north crane pad and locating a new pad on the south end of the excavation for re-setting the crane and making the required lifts. The pad location and crane positions shall be identified. This evaluation is only valid for lifting the tanks from the excavation within the parameters specified

Conclusions:

The Grove 9120 load charts verify the crane can lift the tanks with the loading assumptions specified. The lift for V-2 governs the evaluation. At a lift radius of 67-ft, the crane's capacity is rated at 22,200 lbs. The total lifted load is estimated at 20,000 lbs which is 90% of the cranes capacity. This is acceptable, but will make this a Critical Lift. The lifts for V-1 and V-3 are based on a reach of 60-ft and at this radius the cranes capacity is rated at 26,400 lbs. This results in lifts at 76% of the crane's capacity. The lift for V-9 will be at 27% of the cranes capacity. The Grove 9120 crane must be positioned at the south location for lifting tanks V-1, V-2, and V-9. Tank V-3 must be lifted from the north position. The attached sketch on page 15 shows the crane and pad locations with corresponding crane reach distances. The rigging identified in EDF-5595 and shown on drawing 628461 will not change and is still valid.

6. Review (R) and Approval (A) and Acceptance (Ac) Signatures: (See instructions for definitions of terms and significance of signatures.)				
	R/A	Typed Name/Organization	Signature	Date
Performer/ Author	N/A	P. W. Bragassa, P.E./7200		8-16-05
Technical Checker	R	V. J. Balls/5311		8/17/05
Approver	Ac	D. Nickleson/8300		8/17/05
Requestor	R	J. Jessmore/7500		8-17-05
System Engineer	A	G.G. Anderson/7200		8/17/05
Doc. Control		BECKY METCALF		8/29/05
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8. Does document contain sensitive unclassified information?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
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9. Can document be externally distributed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
10. Uniform File Code:	8201 Disposition Authority: A17-31-a-1			
Record Retention Period: Until dismantlement or disposal of facility,				

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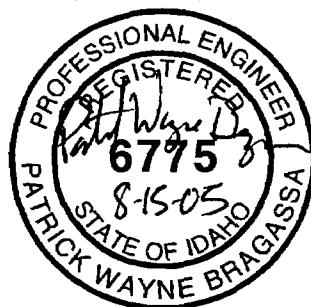
equipment, system or
process; or when
superseded or obsolete,
whichever is earlier.

11. For QA Records Classification Only: Lifetime Nonpermanent Permanent

Item and activity to which the QA Record apply:

12. NRC related? Yes No

13. Registered Professional Engineer's Stamp (if required)



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TSF-09/18 V-Tanks Remediation Crane Verification

1. PURPOSE

The V-Tanks remediation project will remove and treat liquid waste from four underground steel tanks and store the treated waste temporarily in consolidation tanks. The four underground tanks will be removed and the surrounding contaminated soils remediated. The waste will be pumped back into three of the 10,000 gallon V-tanks (V-1, V-2, V-3) and mixed with a solidification agent to stabilize liquid. Once solidified, the tanks with contents will be transported to the INEEL CERCLA Disposal facility (ICDF) for final disposal.

EDF-5595, *TSF-09/18 V-Tanks Remediation Tank Lifting Design*, documents the design of the welded lifting lug to be attached to each of the V-tanks. The lift brackets are design to lift the 15,000 lb tanks with 56,000 lbs of solidified waste material inside. The tanks were analyzed and found to be capable of supporting this lifting operation. In EDF-5595, the methodology to lift the tanks from the excavation was also developed. The design criteria for this particular lift specified that 6000 lbs of dry solidification material would be added to each of the three 15,000 lb tanks prior to the lift for a total payload of 21,000 lbs. As determined by the design in EDF-5595, the on-site Grove TM 9120 crane would not be capable of lifting the tanks, due to the lifting radius required. This resulted in specifying that a larger crane be brought in to make the pick.

Due to developments in the verification of the solidification process, the method of mixing the solidification material with the liquid waste has changed. The material will now be mixed prior to being deposited back into each of the three large V-tanks (V-1, 2, 3). This reduces the weight of the tanks with respect to lifting from the excavation.

An assumption of 750 lbs of material (per tank) was provided by the V-tank project personnel to account for solidification material that may be added to stabilize any residual liquids remaining in the tanks.

While setting equipment at the V-tank site, the Grove TM 9120 crane was positioned on the north crane bearing pad as specified on drawing 628459. The reach radius to tanks V-3 and V-2 was physically checked with the crane. The reach distance to tank V-2 was measured to be 69-ft and the crane load chart showed a capacity of 22,200 lbs at this distance. The distance to Tank V-3 was found to be 55-ft and a capacity of 27,000 lbs was determined. The on-board crane computer indicated the weight of the hook block and head-ache ball assembly to be 3200 lbs. This is approximately 1000 lbs less than what was originally assumed in EDF-5595. It was also determined that the detachable jib that is usually stowed on the boom of the crane is not present, and therefore the weight that is normally deducted from the capacity for this item may be omitted.

Using this new information, the use of the Grove TM 9120 crane to make the tank lifts may now be possible. It was proposed to use the north crane pad to pick the northern most tank (V-3) and construct a second pad on the south side of the excavation to make the picks of V-2, V-1, and V-9. This Engineering Design file shall verify the capability of using the Grove TM 9120 for making the designated lifts.

2. SCOPE

The scope of this EDF is limited to verifying the capability of using the Grove TM 9120 mobile crane for lifting the four V-tanks from the excavation using the existing north crane pad and constructing a new pad on the south end of the excavation for re-setting the crane and making the required lifts. The pad location and crane positions shall be identified. This evaluation is only valid for lifting the tanks from the excavation within the parameters specified.

3. CONCLUSIONS/RESULTS

The Grove 9120 load charts verify that the Grove 9120 can lift the tanks with the loading assumptions specified. The V-2 lift is the controlling operation due to its reach radius. The actual reach radius for a lift is always rounded up to the next chart value shown when in between listed values. This provides an additional factor of safety.

The lift for V-2 governs the evaluation. At a lift radius of 67-ft, the crane's capacity is rated at 22,200 lbs. The total lifted load is estimated at 20,000 lbs which is 90% of the cranes capacity. This is acceptable, but will make this a Critical Lift.

The lifts for V-1 and V-3 are based on a reach of 60-ft and at this radius the cranes capacity is rated at 26,400 lbs. This results in lifts at 76% of the crane's capacity. The lift for V-9 will be at 27% of the cranes capacity.

The crane must be positioned at the south location for lifting tanks V-1, V-2, and V-9. Tank V-3 must be lifted from the north position. The attached sketch on page 15 shows the crane and pad locations with corresponding crane reach distances. The rigging identified in EDF-5595 and shown on drawing 628461 will not change and is still valid.

4. SAFETY CATEGORY

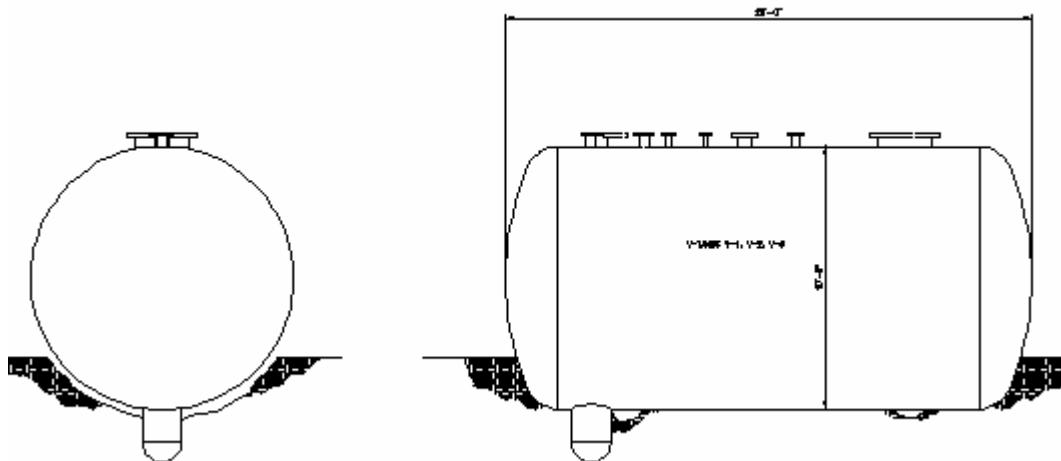
The demolition work contained in this EDF is considered "Consumer Grade", as specified in the Technical and Functional requirements document (TFR-278). All design and construction will comply with the quality requirements specified for this level of safety category.

5. NATURAL PHENOMENA HAZARDS PERFORMANCE CATEGORY

The system is classified as safety category consumer grade (CG) in accordance with the requirements of management control procedure MCP-540 titled *Documenting the Safety Category of Structures, Systems, and Components*. The safety basis for performing V-tank remedial activities is documented in the *Safety Analysis Report for Test Area North Operations* SAR-208. There are no special requirements regarding industrial or natural phenomena hazards. Normal industrial and environmental hazards will be routinely addressed per the work control process (the system performance category designation is PC 0).

6. STRUCTURE SYSTEM OR COMPONENT DESCRIPTION

The system is the temporary installation required for safely removing and treating the contents of Tanks V-1, V-2, V-3 and V-9 and preparing both the treated contents and empty tanks for disposal at the ICDF. The TAN remediation sites are known as TSF-09 (V-1, V-2, and V-3) and TSF -18 (V-9) at OU 1-10; these four tanks are commonly referred to as the V-tanks. The remediation is being conducted in accordance with the *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999) referred to as the ROD, and any appropriate amendments. Tanks V-1, V-2, and V-3 are identical stainless steel 10,000 gallon tanks 10 ft in diameter with a nominal 20 ft length, and located approximately 11 ft below grade.



V-Tank Elevation

7. DESIGN LOADS

The tank weight is based on a measured thickness of 1/2" 304L stainless steel. This thickness results in an empty tank weight of approximately 15,000 lbs, which includes an assumption of the sump volume filled with sludge that cannot be retrieved.

The tank lift from the excavation shall include the dead weight of the tanks plus 750 lbs of dry solidification agent, assumed uniformly distributed.

8. ASSUMPTIONS

- Tank Empty weights for the 10,000 gallon tanks (V-1, 2, 3) are 15,000 lbs each. V-9 weighs 2,200 lbs (EDF-5595)
- 750 lbs of solidification agent will be added to each of tanks V-1, V-2, V-3.

- The Grove 9120 detachable jib has been removed and will not be replaced
- Load Block and headache ball combined weight = 3200 lbs.
-

9. ACCEPTANCE CRITERIA

The use of the Grove 9120 shall be acceptable if it can be proven that the maximum lift is within 95% of the crane's capacity.

10. REFERENCES

- Grove TM 9120 Load Chart Manual, Grove North America
- Technical and Function Requirements (TFR-278) *T&FR for the Remediation of V-Tanks, TSF-09 and TSF-18, Operable Unit 1-10.*
- Safety Analysis Report for Test Area North Operations SAR-208.
- DOE-STD-1090, Department of Energy Hoisting and Rigging Standard
- EDF-5595, TSF-09/18 V-Tanks Remediation Tank Lifting Design, P.W. Bragassa, P.E., Bechtel BBWI

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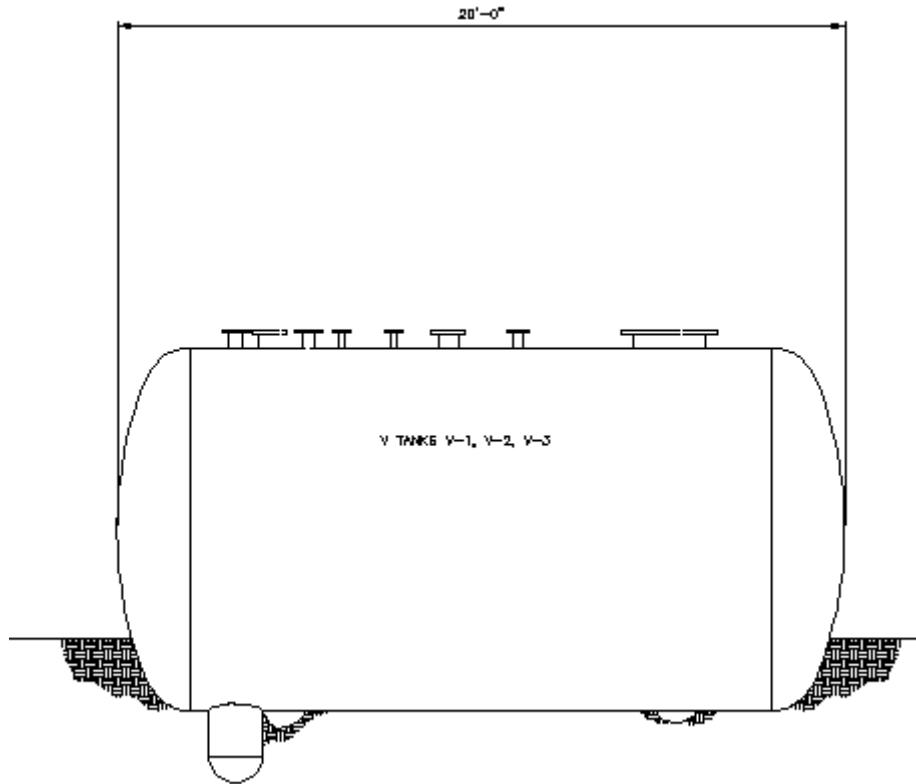
11. CALCULATIONS

TAN V Tanks Rigging Design Modifications

Dimensional definitions:

$$\begin{aligned} \text{pcf} &\equiv \frac{\text{lbf}}{\text{ft}^3} & \text{plf} &\equiv \frac{\text{lbf}}{\text{ft}} & \text{psf} &\equiv \frac{\text{lbf}}{\text{ft}^2} & \text{kip} &\equiv 1000 \text{lbf} & (\text{lbf} = \text{pound-force}) \\ \text{ksi} &\equiv \frac{\text{kip}}{\text{in}^2} & \text{pli} &\coloneqq \frac{\text{lbf}}{\text{in}} & \text{sf} &\coloneqq \text{ft}^2 & \text{psi} &\coloneqq \frac{\text{lbf}}{\text{in}^2} \end{aligned}$$

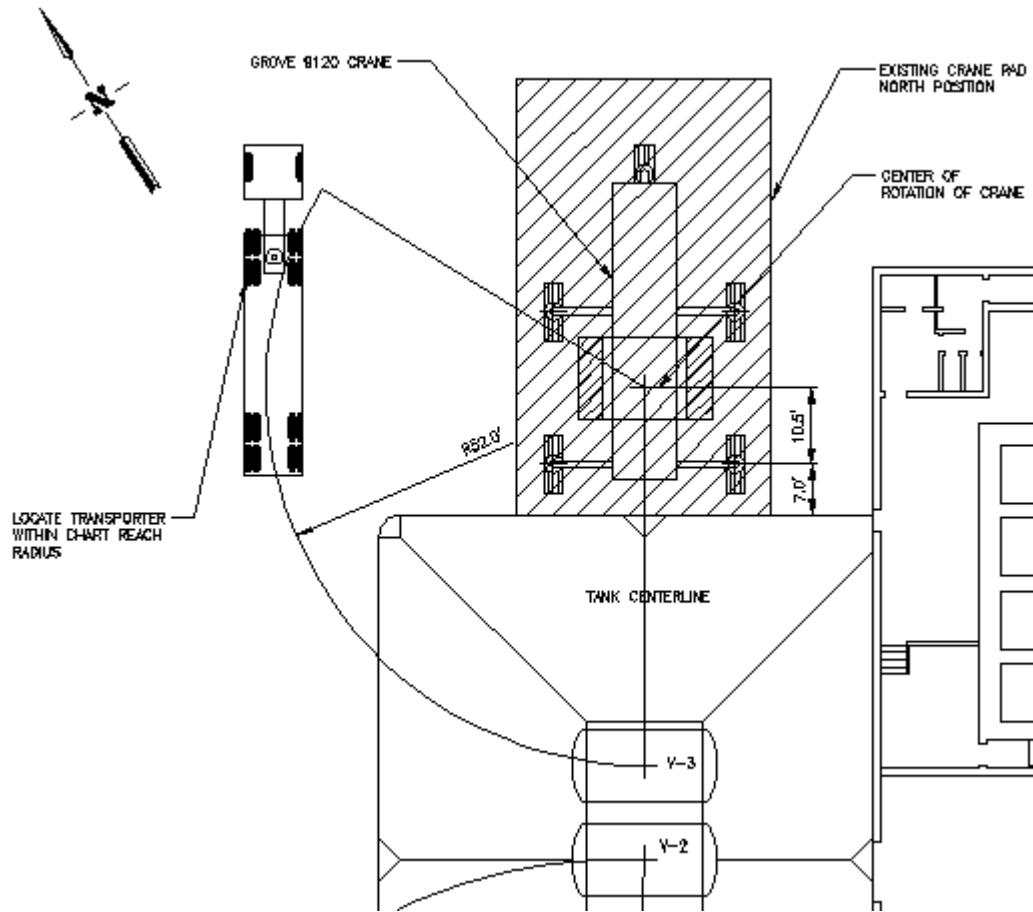
V- Tanks V-1, V-2, V-3



Elevation View of V-Tank

Crane Verification: Determine if the D&D Grove 9120 Crane can be used to pick the tanks if the crane is set up on both the north and south sides of the excavation. The solidification agent added to the tanks will be limited to 750 lbs.

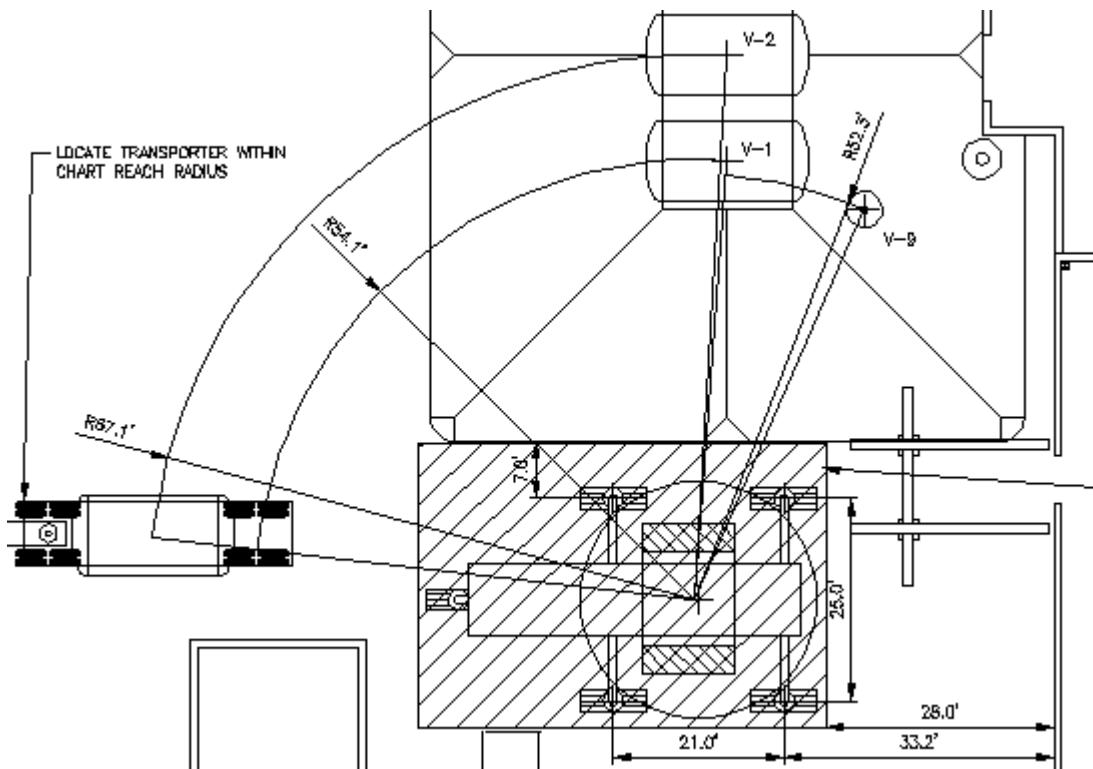
Tank calculated weight with 1/2" thickness: weight1 := 1500lbf



Crane Pad and Set Up at North Position

Reach radius: North Pad Position

$$\begin{aligned}V-3 &= 52\text{-ft} \\V-2 &= 69\text{-ft}\end{aligned}$$



Crane Pad and Set Up at South Position

Reach Radius: V-2 = 67-ft V-1 = 54-ft V-9 = 52-ft

Check the capacity of the INEEL Grove 9120 Mobile Crane:

using the weight of the tank at 15,000 lbf:

Crane Load Data:

The hook block and ball weight measured by the crane will be used: (3200 lbs)

The 15-ft 50 ton spreader bar wt = 1000 lbs

Tank wt breakdown:(EDF-5595)

vessel: 14,250 lbs

piping,etc: 200 lbs

Sump: 100 lbs

Lift lugs 250 lbs

Residual Sludge: 200 lbs

Total: 15,000 lbs

Use 15,000 lbs

CRANE LOAD CAPACITY NOTES:

CRANE: GROVE TM 9120

BOOM: 130.0' MAIN BOOM (JIB STOWED)

COUNTER WEIGHTS: 30,000 LBS

OUTRIGGERS: 100% DEPLOYED

LOAD CAPACITIES BASED ON 360° OF ROTATION AND FLY EXTENDED

ADDITIONAL LOADS:

130 TON HOOK BLOCK = 3200 LBS **

WIRE ROPE = 300 LBS

RIGGING AND MISC. = 1000 LBS

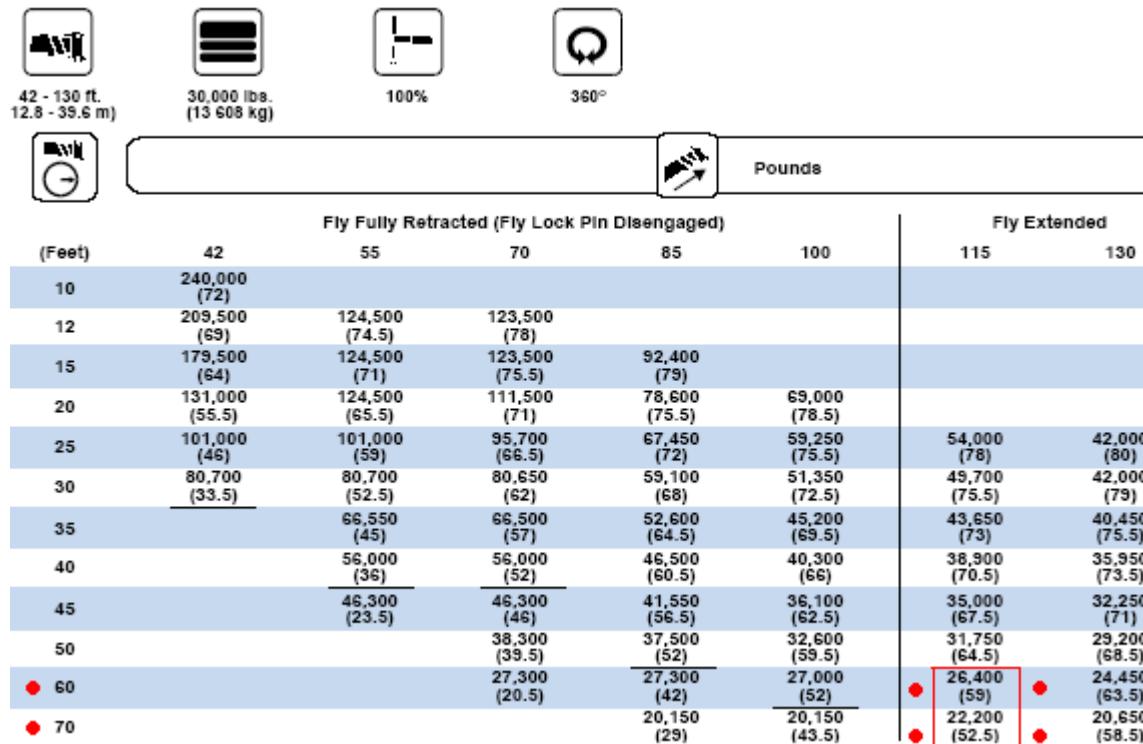
RETRACTABLE JIB = (REMOVED)

SOLIDIFICATION AGENT = 750 LBS

TOTAL ADDITIONAL LOADS = 5250 LBS

** ACTUAL READOUT FROM CRANE COMPUTER

Load Chart from Grove Manual



The load chart above verifies that the Grove 9120 can lift the tanks with the loading assumptions specified. The V-2 lift is the controlling operation due to its reach radius. The actual reach radius for a lift is always rounded up to the next chart value shown when in between listed values. This provides an additional factor of safety.

The lift for V-2 governs the evaluation. Due to the reach distance of 67-ft, the cranes capacity is limited to 22,200 lbs. The total lifted load is estimated at 20,250 lbs which is 91% of the cranes capacity. This is acceptable, but will make this a Critical Lift.

The lifts for V-1 and V-3 are based on a reach of 60-ft and the cranes capacity is given as 26,400 lbs. This results in lifts at 77% of the crane's capacity. The lift for V-9 will be at 28% of the crane's capacity.

The crane must be positioned at the south location for lifting tanks V-1, V-2, and V-9. Tank V-3 must be lifted from the north position. The attached sketch shows the crane and pad locations with corresponding crane reach distances.

CRANE CAPACITY TABLE-NORTH POSITION									
	TANK	MEASURED REACH RADIUS (FT)	CHART REACH RADIUS (FT)	BOOM LENGTH (FT)	CAPACITY (LBS)	EMPTY TANK LOAD (LBS)	TOTAL LIFTED * LOAD (LBS)	RESERVE CAPACITY (LBS)	% CAP
LIFTING TANKS FROM EXCAVATION	V-3	52	60	115	26,400	15,000	20,250	6,400	77
	V-2	69	70	115	22,200	15,000	20,250	1,950	91
SETTING TANKS ON TRANSPORTER	LOCATE TRANSPORTER WITHIN THE REACH RADIUS FOR EACH TANK AS STATED ABOVE FOR "LIFTING TANKS FROM EXCAVATION".								

CRANE CAPACITY TABLE-SOUTH POSITION									
	TANK	MEASURED REACH RADIUS (FT)	CHART REACH RADIUS (FT)	BOOM LENGTH (FT)	CAPACITY (LBS)	EMPTY TANK LOAD (LBS)	TOTAL LIFTED * LOAD (LBS)	RESERVE CAPACITY (LBS)	% CAP
LIFTING TANKS FROM EXCAVATION	V-2	67	70	115	22,200	15,000	20,250	1,950	91
	V-1	52	60	115	26,400	15,000	20,250	6,150	77
	V-3	52	60	115	26,400	2,200	7,450	18,350	28
SETTING TANKS ON TRANSPDRTER	LOCATE TRANSPORTER WITHIN THE REACH RADIUS FOR EACH TANK AS STATED ABOVE FOR "LIFTING TANKS FROM EXCAVATION".								

* INCLUDES TANK WEIGHT + CRANE ADDITIONAL LOADS+SOLIDIFICATION AGENT

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